

**Claims**

1. A microscope having at least one illumination beam path (2; 2, 2') and at least one detection beam path (5), **characterized in that**
- each illumination beam path (2; 2, 2') is provided with a focusing arrangement (3; 3, 3') for producing a two-dimensional object illumination region (20) which extends in the direction of an illumination axis of the illumination beam path (2; 2, 2') and transversely thereto,
  - a detection direction (10) of the at least one detection beam path (5) is approximately orthogonal to the two-dimensional object illumination region (20), and
  - a mobile arrangement (12) is provided for producing a relative movement between the two-dimensional object illumination region (20) and an object (4) to be studied.
2. The microscope as claimed in claim 1, characterized in that the mobile arrangement (12) can produce a rotational movement of the object (4) and/or a displacement movement of the object (4).
3. The microscope as claimed in claim 1 or 2, characterized in that the mobile arrangement (12) is designed to move the object (4) while the two-dimensional object illumination region (20) is essentially stationary.
4. The microscope as claimed in claim 1 or 2, characterized in that the mobile arrangement is designed to move the two-dimensional object illumination region (20) while the object (4) is essentially stationary.
5. The microscope as claimed in one of claims 1 to 4, characterized in that the at least one illumination beam path (2; 2, 2') has a cylindrical lens (3; 3, 3') for focusing the illumination light.

6. The microscope as claimed in claim 5, characterized in that the cylindrical lens (3; 3, 3') can be rotated about the illumination axis and/or displaced in the direction of the illumination axis and/or the cylinder axis, and/or can be tilted via the cylinder axis with respect to the illumination axis.

7. The microscope as claimed in claim 6, characterized in that the movement of the cylindrical lens (3; 3, 3') is a high-frequency movement.

8. The microscope as claimed in one of claims 1 to 7, characterized in that scattered light or fluorescent light of one or more wavelengths is used.

9. The microscope as claimed in one of claims 1 to 8, characterized in that the light source (1; 1, 1') is a lamp or a laser, which provides light of one or more wavelengths.

10. The microscope as claimed in one of claims 1 to 9, characterized in that the object (4) is to be held by a holder (12) in a sample chamber (13), in which it can be rotated about an axis (14) corresponding essentially to the gravitational direction and can be moved along at least one direction.

11. The microscope as claimed in one of claims 1 to 10, characterized in that at least two illumination beam paths (2, 2') with essentially opposite illumination directions are provided for producing at least locally overlapping two-dimensional object illumination regions (20).

12. The microscope as claimed in claim 11, characterized in that the illumination light of the two illumination beam paths (2, 2') interferes at least locally in the direction of the illumination axis in the region of the two-dimensional object illumination region (20).

13. The microscope as claimed in claim 12, characterized in that the illumination light of the two

illumination beam paths (2, 2') has a constant, adjustable phase.

14. The microscope as claimed in one of claims 1 to 13, characterized in that the at least one detection beam path (5) has a detector, and in that the detector can be moved laterally with respect to the detection direction of the at least one detection beam path (5).

15. The microscope as claimed in one of claims 1 to 14, characterized in that the at least one detection beam path (5; 5') can be adapted so that the detection direction is approximately orthogonal to the two-dimensional object illumination region (20) when the object illumination region (20) is shifted.

16. A microscope having at least one illumination beam path (2) and at least one detection beam path (5), **characterized in that**

- each illumination beam path (2) is provided with a focusing arrangement (3) for producing a linear object illumination region (20') which extends in the direction of an illumination axis of the illumination beam path (2),
- a detection direction (10) of the at least one detection beam path (5) is approximately orthogonal to the linear object illumination region (20'), and
- at least one mobile arrangement (24, 26, 28) is provided for producing a relative movement between the linear object illumination region (20') and an object (4) to be studied.

17. The microscope as claimed in claim 16, characterized in that the at least one mobile arrangement (24, 26, 28) is designed to produce a relative movement between the object (4) and the linear object illumination region (20') essentially orthogonally to the illumination axis and the detection direction (10).

18. The microscope as claimed in claim 17, characterized in that the at least one mobile

arrangement is designed to move the object (4) in order to produce a relative movement.

19. The microscope as claimed in claim 17 or 18, characterized in that the at least one mobile arrangement (24, 26, 28) is designed to move the at least one illumination beam path (2) at least in the linear object illumination region (20') provided by it, in order to produce the relative movement.

20. The microscope as claimed in claim 19, characterized in that the at least one mobile arrangement (24, 26, 28) is designed to move the at least one detection beam path (5) in accordance with the movement of the at least one illumination beam path (2), at least in its region near the object.

21. The microscope as claimed in one of claims 16 to 20, characterized in that the at least one detection beam path (5) has a detector (8) with a multiplicity of detector pixels.

22. The microscope as claimed in claim 21, characterized in that the number and positioning of the detector pixels of the detector (8) are selected so that the at least one detection beam path (5) projects a section of the object (4), illuminated by the at least one illumination beam path (2) in the object illumination region (20'), essentially fully onto the detector (8).

23. The microscope as claimed in one of claims 16 to 22, characterized in that the at least one mobile arrangement is designed to move the object to be studied essentially in the direction of the detection direction (10) of the at least one detection beam path (5).

24. A microscope having at least one illumination beam path (2; 2, 2') and at least one detection beam path (5), **characterized in that**

- each illumination beam path (2; 2, 2') is provided with a focusing arrangement (3; 3, 3') for producing an object illumination region (20; 20')

- which extends in the direction of an illumination axis of the illumination beam path (2; 2, 2'),
- a detection device (10) of the at least one detection beam path (5) is approximately  
5 orthogonal to the object illumination region (20; 20'), and
  - a mobile arrangement is provided for producing a relative movement between the object illumination region (20; 20') and an object (4) to be studied.